

CLAIMS

5

1. A charged particle beam device (1) for inspecting or structuring a specimen (3) having a charged particle beam source (5) to generate a charged particle beam (7), a focussing lens (9) to focus the charged particle beam (7) onto the specimen (3), and an aperture system (13) for defining an aperture (6) for the charged particle beam (7), the aperture system (13) comprising:

10

- a first member (20) to block a first portion (7a) of the charged particle beam (7) between the charged particle beam source (5) and the focussing lens (9);
- a second member (30) to block a second portion (7b) of the charged particle beam (7) between the charged particle beam source (5) and the focussing lens (9);
- first means (24) for moving the first member (20) to adjust the size of the blocked first portion (7a) of the charged particle beam (7); and
- second means (34) for moving the second member (30) independently of the first member (20).

15

20

25

2. The charged particle beam device according to claim 1, whereby the first member (20) and the second member (30) have a respective first edge (22) and second edge (32) capable of defining a respective first boundary (28) and second boundary (38) of the aperture (6).

30

3. The charged particle beam device according to claim 2, whereby the first edge (22) and/or the second edge (32) are shaped to provide a first boundary (28) and/or a second boundary (38) which extend essentially linearly.

4. The charged particle beam device according to claim 2, whereby the first edge (22) and the second edge (32) are shaped to provide a first boundary (28) and a second boundary (38) which extend essentially in parallel.

5. The charged particle beam device according to any one of the claims 2 to 4, whereby the first edge (22) and/or the second edge (32) are shaped to provide an angled or rounded first and/or second boundary (28; 38).

6. The charged particle beam device according to any one of the claims 2 to 5, whereby the first means (24) and/or the second means (34) for moving the respective first and/or the second member (20; 30) are capable of moving the respective first edge (22) and/or second edge (32) without changing the shape of the aperture (6).

7. The charged particle beam device according to anyone of the preceding claims, whereby the first means (24) and/or second means (34) for moving the respective first and/or second member (20; 30) each include a respective first motor and/or a second motor or, preferably, a respective first piezo-drive and/or a second piezodrive.

8. The charged particle beam device according to any one of the preceding claims comprising third, fourth, fifth, sixth, seventh and/or eighth members (40; 50; 60; 70; 80; 90) to selectively block respective third, fourth, fifth, sixth, seventh and/or eighth portions (7d; 7e; 7f; 7g; 7h; 7i) of the charged particle beam (7) between the charged particle beam source (5) and the focussing lens (9).

9. The charged particle beam device according to claim 8 comprising third, fourth, fifth, sixth, seventh and/or eighth means (44; 54; 64; 74; 84; 94) for moving the respective third, fourth, fifth, sixth, seventh and/or eighth members (40; 50; 60; 70; 80; 90) to adjust the sizes of the blocked respective third, fourth, fifth, sixth, seventh and/or eighth portions (7d; 7e; 7f; 7g; 7h; 7i) of the charged particle beam (7) independently of the respective other portions.

10. The charged particle beam device according to any one of the claims 8 or 9,
whereby the third, fourth, fifth, sixth, seventh and/or eighth member (40; 50; 60;
70; 80; 90) have respective third, fourth, fifth, sixth, seventh and/or eighth edges
(42; 52; 62; 72; 82; 92) capable of defining respective third, fourth, fifth, sixth,
seventh and/or eighth boundaries (48; 58; 68; 78; 88; 98) of the aperture (6).
11. The charged particle beam device according to claim 10, whereby the third, fourth,
fifth, sixth, seventh and/or eighth edge (40; 50; 60; 70; 80; 90) is shaped to provide
a respective third, fourth, fifth, sixth, seventh and/or eighth boundary (48; 58; 68;
78; 88; 98) which extends essentially linearly.
12. The charged particle beam device according to any one of the claims 10 to 11,
whereby the third, fourth, fifth, sixth, seventh and/or eighth means (44; 54; 64; 74;
84; 94) for moving the respective third, fourth, fifth, sixth, seventh and/or eighth
member (40; 50; 60; 70; 80; 90) are each capable of moving the respective third,
fourth, fifth, sixth, seventh and/or eighth edges (42; 52; 62; 72; 82; 92) without
changing the shape of the aperture (6).
13. The charged particle beam device according to any one of the claims 10 to 12,
whereby the third edge (42) and the fourth edge (52), the fifth edge (62) and the
sixth edge (72), and/or the seventh edge (82) and the eighth edge (92) pair-wise
extend essentially in parallel with a tolerance of less than 10 degrees and,
preferably, less than 5 degrees.
14. The charged particle beam device according to any one of the preceding claims,
whereby first, second, fourth, fifth, sixth, seventh and/or eighth means (24, 34, 44,
54, 64, 74, 84, 94) for moving the respective first, second, fourth, fifth, sixth,
seventh and/or eighth members are capable of moving the respective member with
steps having a step size smaller than 10 μm , preferably smaller than 1 μm and even
more preferred smaller than 0,1 μm .
15. The charged particle beam device according to any one of the preceding claims,
whereby the first, second, third, fourth, fifth, sixth, seventh and/or eighth means
(24, 34, 44; 54; 64; 74; 84; 94) for moving the respective first, second, third,

fourth, fifth, sixth, seventh and/or eighth member (20, 30, 40; 50; 60; 70; 80; 90) include a respective first, second, third, fourth, fifth, sixth, seventh and/or eighth motor or, preferably, a respective first, second third, fourth, fifth, sixth, seventh and/or eighth piezo-drive to move the respective first, second, third, fourth, fifth, sixth, seventh and/or eighth edge (22, 32, 42; 52; 62; 72; 82; 92).

16. The charged particle beam device according to any one of the preceding claims, whereby the charged particle beam device (1) includes a scanning unit (17) to scan the charged particle beam (7) across the specimen (3).

17. The charged particle beam device according to any one of the preceding claims, whereby the charged particle beam device (1) is an electron beam device, preferably a scanning electron microscope, or a focussing ion beam device.

18. The charged particle beam device according any one of the preceding claims including a magnetic octupole component (101) and/or an electrostatic octupole component (101).

19. The charged particle beam device according any one of the preceding claims including a magnetic hexapole component (101) and/or an electrostatic hexapole component (101) to shape the charged particle beam (7).

20. The charged particle beam device according any one of the preceding claims having the first, second and third members (20; 30; 40) oriented to define a triangular aperture (6) for the charged particle beam (7).

21. Method for focussing a charged particle beam (7) onto a specimen (3) with the steps:

- providing a charged particle beam device (1) according to any one of the preceding claims;
- generating the charged particle beam (7);

- passing the charged particle beam (7) through a rectangular shaped aperture (6);
- passing the charged particle beam (7) through a magnetic and/or electric octupole field; and
- directing the charged particle beam (7) onto the specimen (3).

22. Method for focussing a charged particle beam (7) onto a specimen (3) with the steps:

- providing a charged particle beam device (1) according to any one of the preceding claims;
- generating the charged particle beam (7);
- passing the charged particle beam (7) through a triangular shaped aperture (6);
- passing the charged particle beam (7) through a magnetic or electric hexapole field; and
- directing the charged particle beam (7) onto the specimen (3).